

Haimeng Zhao

Last Updated: April 11, 2025

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EDUCATION

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| California Institute of Technology Ph.D. Student in Physics, Advisor: John Preskill and Hsin-Yuan Huang | Pasadena, CA 2024–Current |
| Tsinghua University B.S. in Mathematics and Physics with <i>Honours</i> and <i>Summa Cum Laude</i> , GPA: 3.96/4 Thesis: <i>Quantum Advantage in Machine Learning</i> , Advisor: Dong-Ling Deng <i>Valedictorian</i> of the Tsinghua Xuetaang Talents Program in Physics | Beijing, China 2020–2024 |
| École Polytechnique Fédérale de Lausanne (EPFL) Exchange student in Physics, GPA: 6/6, Advisor: Giuseppe Carleo | Lausanne, Switzerland 2022–2023 |

EXPERIENCE

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| Google Quantum AI Student Researcher (Mentored by Jarrod R. McClean) | Los Angeles, CA 2025 |
| Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua Research Assistant (Mentored by Dong-Ling Deng) | Beijing, China 2023–2024 |
| Institute for Quantum Information and Matter (IQIM), Caltech Summer Undergraduate Research Fellow (Mentored by John Preskill and Matthias C. Caro) | Pasadena, CA 2023 |
| Computational Quantum Science Laboratory (CQSL), EPFL Research Assistant (Mentored by Giuseppe Carleo and Filippo Vicentini) | Lausanne, Switzerland 2022–2023 |
| Department of Astronomy, Tsinghua Research Assistant (Mentored by Wei Zhu) | Beijing, China 2021–2022 |

HONORS AND AWARDS

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| • Amazon Web Services (AWS) Graduate Fellowship | 2024 |
| • Graduate with the Highest Honours (Honours Degree and 1 st Place in Physics), Tsinghua University | 2024 |
| • Graduate with the Highest Distinction (Summa Cum Laude, 75/3500 per class), Tsinghua University | 2024 |
| • Valedictorian of Class 2024, Tsinghua Xuetaang Talents Program in Physics | 2024 |
| • Highest Honor for Undergraduate Students, Tsinghua University (清华特等奖学金, 10/3500 per class) | 2023 |
| • Caltech Summer Undergraduate Research Fellowship | 2023 |
| • National Scholarship, The Ministry of Education of China (top 0.2% nationwide) | 2022 |
| • Scholarship of the National Astronomical Observatory of China | 2022 |
| • Lin-bridge Scholarship, Department of Astronomy, Peking University | 2022 |
| • S.-T. Yau College Student Mathematics Contest, Hermann Weyl Silver Medal (2 nd Place in Mathematical Physics) | 2022 |
| • S.-T. Yau College Student Mathematics Contest, Team Bronze Medal | 2022 |
| • Dean's Award (1 st Place in Physics), Zhili College, Tsinghua University | 2022 |

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| • Spark Research Talents Fellowship, Tsinghua University (星火计划 16 期, 50/3500 per class) | 2022–2024 |
| • Tsinghua-Xitai Scholarship for Comprehensive Excellence, Tsinghua University | 2021 |
| • Tsinghua-UbiQuant Scholarship for Scientific Innovation, Tsinghua University | 2021–2023 |
| • Chi-Sun Yeh Scholarship, Member of the Tsinghua Xuetao Talents Program | 2020–2024 |
| • Outstanding Graduate & Best Student Award (1 per class), Shanghai High School | 2020 |
| • S.-T. Yau High School Science Award, Gold Medal (1 st Place) in Computer Science | 2019 |
| • 19 th National Awarding Program for Future Scientists, 1 st Place, China Association for Science and Technology | 2019 |
| • 36 th Chinese Physics Olympiad, Bronze Medal, First Prize in Shanghai, Chinese Physics Society | 2019 |

ACADEMIC SERVICE

Journal review: Nature Communications, npj Quantum Information, Quantum, Quantum Machine Intelligence, IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), Journal of Machine Learning Research (JMLR), IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)

Conference review: QIP, TQC, QTML, QCTiP, NeurIPS, ICML

TEACHING

Teaching Assistant: Ph/CS 219 Quantum Computation (2025) at Caltech

PUBLICATIONS

(* for equal contribution)

- [1] **H. Zhao**, Y. Zhang, and J. Preskill, “Learning to erase quantum states: thermodynamic implications of quantum learning theory”, (2025), arXiv:2504.07341.
- [2] **H. Zhao** and D.-L. Deng, “Entanglement-induced Provable and Robust Quantum Learning Advantages”, (2024), arXiv:2410.03094.
- [3] **H. Zhao***, L. Lewis*, I. Kannan*, Y. Quek, H.-Y. Huang, and M. C. Caro, “Learning Quantum States and Unitaries of Bounded Gate Complexity”, PRX Quantum, 040306 (2024), featured on the cover and in the International Year of Quantum Collection.
- [4] **H. Zhao**, G. Carleo, and F. Vicentini, “Empirical Sample Complexity of Neural Network Mixed State Reconstruction”, Quantum **8**, 1358 (2024).
- [5] **H. Zhao**, “Non-IID Quantum Federated Learning with One-shot Communication Complexity”, Quantum Machine Intelligence **5**, 3 (2023).
- [6] J. Liu, Y. Tang, **H. Zhao**, X. Wang, F. Li, and J. Zhang, “CPS Attack Detection under Limited Local Information in Cyber Security: An Ensemble Multi-Node Multi-Class Classification Approach”, ACM Transactions on Sensor Networks **20**, 1–27 (2024).
- [7] **H. Zhao** and W. Zhu, “MAGIC: Microlensing Analysis Guided by Intelligent Computation”, The Astronomical Journal **164**, 192 (2022).
- [8] **H. Zhao** and P. Liao, “CAE-ADMM: Implicit Bitrate Optimization via ADMM-based Pruning in Compressive Autoencoders”, (2019), arXiv:1901.07196 [cs.CV].

TALKS

1. “Entanglement-induced provable and robust quantum learning advantages”, Contributed talk at the APS Global Physics Summit, Anaheim, California, Mar. 17th, 2025.
2. “Learning quantum states and unitaries of bounded gate complexity”, Contributed plenary long talk at the 24th Asian Quantum Information Science Conference (AQIS 24), Hokkaido University, Aug. 30th, 2024.
3. “Learning quantum states and unitaries of bounded gate complexity”, Invited talk at the Fortnight Seminar Series for Young Scientists, KouShare, Dec. 22nd, 2023.
4. “Learning quantum states and unitaries of bounded gate complexity”, Invited talk at the Institute for Advanced Study, Tsinghua University, Dec. 3rd, 2023.
5. “Learning quantum states and unitaries of bounded gate complexity”, Invited talk at the Chi-Sun Yeh Student Seminar, Tsinghua University, Dec. 2nd, 2023.
6. “Learning quantum states and unitaries of bounded gate complexity”, Invited talk at the Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University, Dec. 1st, 2023.
7. “Non-IID quantum federated learning with one-shot communication complexity”, Contributed talk at Quantum Techniques in Machine Learning (QTML 2023), CERN, Nov. 20th, 2023.
8. “A biased tour in the intersection of physics and machine learning”, Invited talk at the Chi-Sun Yeh Student Seminar, Tsinghua University, Mar. 12th, 2023.
9. “Empirical sample complexity of neural network mixed state tomography”, Invited talk at the Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University, Mar. 2nd, 2023.
10. “How can AI do science? A case study on microlensing”, Contributed talk at Zhili College Research Forum, Tsinghua University, Oct. 22nd, 2022.
11. “MAGIC: Microlensing analysis guided by intelligent computation”, Contributed talk at the AI for Astronomy conference, National Astronomical Observatory of China, Nov. 25th, 2022.
12. “MAGIC: Microlensing analysis guided by intelligent computation”, Invited talk at the Department of Astronomy, Tsinghua University, Oct. 10th, 2022.
13. “MAGIC: Microlensing analysis guided by intelligent computation”, Contributed talk at the Student Astronomy Seminar, Department of Astronomy, Peking University, Sep. 23th, 2022.